Exploring the effect of national cultural disposition on drone technology adoption and development

Cite as: AIP Conference Proceedings **2172**, 080012 (2019); https://doi.org/10.1063/1.5133570
Published Online: 13 November 2019

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Exploring the Effect of National Cultural Disposition on Drone Technology Adoption and Development

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Abstract. The 21st century has witnessed a paradigm shift of drone technology from military operations to civil operations sparking off a growing interest in all the three main sectors of the economy; primary sector, secondary sector and service or tertiary sector. Culture is known to influence the diffusion and adoption of certain technologies in any given nation. As such, this study uses a binomial logistic regression technique on Hofstede's cultural dimensions and drone regulation existence in a selected number of countries to statistically assess whether national culture influences the adoption of drone regulations.

INTRODUCTION

The gradual penetration of drone technology as a paradigm shift from military sector to commercial civil sector, has led to the emergence of a series of challenges to the aviation legal system due to the risk and threats associated with the drone technology [1]. Drone technology has already made a profound impact on all aviation systems all over the world[1]. This impact is evident in the United Kingdom following a number of incidents involving drone misses with passenger planes prompting a state of urgency to combat or tame the raise and development of drone technology [2]. Due to the speculated disruptive influence on the aviation agencies all over the world, different countries through their respective aviation agencies have taken different approaches towards mitigating the threat posed from drone operations [3]. Majority of the countries decided to include acts governing drone operations [4] where some countries allow commercial drone operations but under a strict set of rules [4], while others only all experimental drone operations beyond visual line of sight. However some countries resorted to completely put a ban on commercial drone operations due to the fact that many people are in a state of apprehension when it comes to drone technology [5].

LITERATURE REVIEW

Each country has their own distinctive culture that depict their core identity influence what norms they follow, values they hold and expected behaviors [6]. Culture is defined as a system of inherited conceptions articulated in symbolic ways by how people communicate [7], perpetuate and develop their knowledge about and attitudes toward

[1] The Human Environment and Transport Inspectorate – CAA-NL Postbus 16191 | 2500 BD Den Haag The Netherlands T 088 489 00 00 URL: www.ilent.nl June 2015

Proceedings of the 45th International Conference on Application of Mathematics in Engineering and Economics (AMEE'19)
AIP Conf. Proc. 2172, 080012-1–080012-4; https://doi.org/10.1063/1.5133570
Published by AIP Publishing. 978-0-7354-1919-3/$30.00

life [8]. A country's culture frames the mindsets of its people which in turn influences the socio-economic ecosystem and how they interact with the outside world.

Hofstede's model of cultural dimensions is a widely accepted framework in analyzing a country's culture [15]. In his original paradigm after studying individuals from 40 countries [9], Hofstede proposed 5 dimensions to differentiate culture: Individualism-collectivism; Uncertainty avoidance; Power distance (strength of social hierarchy); Masculinity-femininity (task orientation versus person-orientation); Long term orientation and short term orientation.

Power distance refers to the degree to which an organization, institution or a society accept and expect unequal distribution of power [10]. It concentrates on the extent of equality and inequality among people in a given society. Power distance relates to the close relationship between education and occupational status [11]. Individualism refers to the degree in which the society fosters individualisms [12]. In other words, it is the extent to which the ties between individuals are loose. Thus, everyone is expected to look after him or herself and his or her immediate family [11]. Uncertainty avoidance index is the degree to which the society is tolerant to uncertainty from the norms and ambiguity [11]. Masculinity refers to the degree by which emotional roles are distributed between the genders. According to Hofstede, in masculine dominated countries, values are characterized by self-centeredness [12], materialism, assertiveness, power and ambition, whereas feminine [13] societies, the values are more focused on interdependence, relationships, service and quality of life. Different countries have different gender stereotype [14]. In long-term oriented societies, values are focused more the future importance rather than the current. The values are characterized by rewards, continuous persistence, saving and adaptation capability [11]. On the contrary, in short term oriented societies, values are characterized by the past and the present, emphasizing stability, respect for tradition, preservation of one's norms, reciprocation and fulfilling social obligations.

From observing literature, it is inferable that research has not towed the line of exploring the relationship between national culture and drone technology adoption. Thus this study aims at contributing to literature on drone technology, its adoption and its regulations as pertaining to the influence of cultural disposition of any given country by adopting Hofstede's conceptualisation of cultural dimensions [15]. The next section discusses the data and methodology adopted for the study.

DATA AND METHODOLOGY

Before going into the details of the study's data sources and methodological approach, it is pertinent that the research question be established. The main research question this study seeks to answer is;

Does culture of any society influence the diffusion of drone technology and drone regulation adoption?

The study employed data from Hofstede's cultural dimensions and clustered selected countries from the international drone legislation approaches [16]. For the purpose of the study, long-term orientation was exempted from the analysis due to the unavailability of observations (i.e. missing data [17]) for the following countries UAE, Italy, Costa Rica, Argentina, and Saudi Arabia. Table 1 is a representation of the data which outlines the relationship between drone regulations and Hofstede's cultural dimensions. The table 1; Shows a list countries categorized into a group of three (Allowed, Experimental BVLOS and Outright ban) in terms on their respective drone regulations as well as shows the data[2] of cultural dimensions of each respective country.

A binomial logistic regression approach was adopted to answer the research question. The reason this study opted for the binomial logistic regression model is because it allows for the simultaneous analysis of multiple explanatory variables, while reducing the effect of confounding factors [18]. The model was fitted with data in Table 1 to ascertain the factors which influence the presence of drone regulations in the selected countries. Countries with drone regulations were labeled as *Yes* and those without any such regulations, *No*. The statistical model for analysis is represented as such:

$$\boldsymbol{Drone\ Regulations \sim PDI + IDV + UAI + MAS}$$

Where Drone Regulations is the dependent variable and *PDI, IDV, UAI* and *MAS* are the explanatory variables.

[2] (Geert Hofstede 's cultural dimension Theory data) URL: https://data.world/adamhelsinger/geerthofstedeculturaldimension

TABLE 1. Relationship between drone technology regulations and Hosftede's cultural dimensions.

Drone regulations	Countries	PDI	IDV	UAI	MAS
Allowed	UAE	80	38	68	52
	Sweden	31	71	29	5
	Italy	50	76	75	70
	Costa Rica	35	15	86	21
Experimental beyond visual line of sight (BVLOS)	UK	35	89	66	35
	Australia	38	90	61	51
	USA	40	91	62	46
	Canada	39	80	52	48
	China	80	20	66	30
	France	68	71	43	86
	Russia	93	39	36	95
Outright ban	Morocco	70	46	68	53
	Argentina	49	46	86	56
	India	77	48	40	56
	Saudi Arabia	80	38	68	52
	Colombia	67	13	64	80

FINDINGS AND DISCUSSION

This section elaborates on the findings obtained from performing the binomial logistic regression as well as basic statistical inferences on the data. From Table 2, the results of the generalized regression model yielded no significance with explanatory variables. This means that none of the explanatory variables representing national culture (i.e. power distance, individualism, uncertainty avoidance & masculinity) have any influence on the existence of drone regulations and drone technology diffusion in any given country.

TABLE 2*. Results of Binomial Regression Model (for 2 levels of Drone Regulations – Yes & No)*

Deviance Residuals:					
	Min	**1Q**	**Median**	**3Q**	**Max**
	-1.9071	-0.8493	0.2831	1.2921	0.8655
Coefficients:					
	Estimate	**Std. Error**	**z value**	**Pr(>|z|)**	
(Intercept)	7.39031	8.48861	0.871	0.384	
PDI	-0.03682	0.05481	-0.672	0.502	
IDV	0.02512	0.03636	0.691	0.490	
UAI	-0.05962	0.06600	-0.903	0.366	
MAS	-0.03098	0.03960	-0.782	0.434	
AIC: 25.122					

Thus, the answer to the proposed research question is: *No, culture of any nation does not have any significant influence on the diffusion of drone technology and adoption of drone regulations.* Due to the top-down approach with regards to the enactment of drone regulations, one can deduce that national culture has no say in the adoption of drone regulations in a country – rather, governments have the final say on whether drones should be allowed in any nation.

CONCLUSION

The study explored the relationship between national culture and drone regulation adoption as well as its diffusion by employing the Hofstede's cultural dimensions as a measure for national culture. A statistical model was built and a binomial logistic regression was fit to test the relationship.

A major limitation with respect to this study is the fact that this study was restricted to only sixteen (16) countries in the analysis. Thus for future work, we propose an addition of more countries as well as including other socio-economic factors.

The contribution of this study to theory includes the proposition that national culture has no significant influence on the drone technology development in any given society.

ACKNOWLEDGMENTS

The researchers would like to thank the Graduate School of Economics and Management of Ural Federal University for the support in undertaking the study.

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